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AUDITORY FACTORS IN FOREIGN LANGUAGE ACQUISITION.

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INFORMATION ON THE AUDITORY SKILLS OF FOREIGN LANGUAGE STUDENTS WAS OBTAINED AND A STUDY WAS MADE OF THE RELATIONSHIP OF THOSE SKILLS TO EASE OF MASTERY OF FRENCH AND SPANISH. THIS RESEARCH WAS CONDUCTED TO ANSWER QUESTIONS RAISED BY THE CURRENT TREND IN LANGUAGE INSTRUCTION TOWARD THE DEVELOPMENT OF AUDIOLINGUAL SKILLS BY PREDOMINANTLY AURAL TECHNIQUES. THE PURPOSES OF THIS STUDY WERE TO (1) MEASURE VARIOUS AUDITORY FACTORS OF UNIVERSITY OF FLORIDA STUDENTS ENROLLED IN THE BEGINNING COURSES IN FRENCH AND SPANISH, (2) ASCERTAIN WHETHER A SEX DIFFERENCE EXISTS IN ANY OF THE AUDITORY ASPECTS MEASURED BY THE SEASHORE MEASURES OF MUSICAL TALENTS OR IN ANY OF THE UNIVERSITY OF FLORIDA ORIENTATION TESTS, (3) SEEK TO ASCERTAIN WHETHER ANY OF THE SEASHORE SCORES, PLUS VARIOUS INTELLIGENCE AND APTITUDE FACTORS AS MEASURED BY THE UNIVERSITY OF FLORIDA'S ORIENTATION TEST BATTERY, CAN ENABLE THE PREDICTION OF EASE OR DIFFICULTY OF MASTERING FRENCH OR SPANISH, (4) ASCERTAIN WHETHER SCORES ON THE SEASHORE AUDITORY MEASURES IMPROVE SIGNIFICANTLY AFTER COMPLETING A SEMESTER OF STUDYING FRENCH OR SPANISH, (5) INVESTIGATE SEASHORE AND OTHER POSSIBLE FACTORS IN FRENCH AND SPANISH COURSE DROPOUTS, AND (6) ASCERTAIN WHETHER SIGNIFICANT DIFFERENCES EXIST BETWEEN FRENCH AND SPANISH STUDENTS ON ANY OF THE SPECIFIC FACTORS ABOVE. THIS ARTICLE WAS REPRINTED FROM "THE MODERN LANGUAGE JOURNAL," VOLUME 49, NUMBER 1, JANUARY 1965. (TC)

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*Auditory Factors in Foreign Language Acquisition**

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I. INTRODUCTION

DESPITE our meager knowledge of auditory factors, a current major trend in foreign language instruction is toward "language-laboratory" development of audio-lingual skills by predominantly aural techniques. In some laboratory approaches the students are being asked to learn almost exclusively by ear with a minimum amount of visual contact with the language. Due to the increased auditory demands made by such teaching techniques, it is believed wise to obtain more information on the auditory skills of foreign language students, and to study their possible relationship to ease of mastery of the French and Spanish languages.

As a research tool in speech and languages, the Seashore Measures of Musical Talents might be viewed as laboring under a semantic difficulty due to its title or name. The pitch, intensity, loudness, and time subtests measure basic properties of sound which underlie both speech and music. They measure aspects of audition which are probably as vital to speech and language proficiency as they are to musical ability. Only the rhythm and tonal memory subtests seem to be more closely related to musical ability than to speech. However, even the aptitude measured by the tonal memory subtest—the problem of retaining and comparing sound sequences—is common to both music and speech or language. There are also characteristic rhythms of various languages. In terms of acoustic measurement we know little of the relationship of rhythm—the composite of pitch, loudness, and time factors—to language acquisition. Since the current study is partly concerned with determining which of the basic factors of sound seem most highly related to second language acquisition, it is apparent that the Seashore Measures can be a valid research tool despite the music connotation possible from the words "Musical Talents" in the test's title. Prior experiments in both foreign languages and in speech give indication of the potential fruitfulness of continued research with the Seashore Measures.

The planning of this project was given impetus by the results of a study completed under the direction of Dr. Leutenegger, which investigated the relationship of Seashore scores to measures of achievement in learning to transcribe spoken English in phonetic symbols.[1] In that study, all of the Seashore subtests were significantly correlated with the measures of phonetic achievement.

A similar probing of the relationship of the Seashore Measures to foreign language acquisition, particularly in cases where the instructional techniques emphasize the audio-lingual approach rather than emphasizing reading and writing ability, seemed highly promising.

The ability to predict ease or difficulty of language acquisition would enable the identification of those whose anticipated achievement is poorest. These students could then be given longer sequences of instruction at a slower pace. Also, the drop-out rate might be minimized by identifying and helping those who need additional opportunity for added auditory training.

Similarly, isolation of those with the best potential would make feasible the creation of an accelerated (honors-type) course with greater emphasis on verbal perfection (i.e., near-native pronunciation and intonation) rather than simply the ability to make oneself understood in the foreign language.

The techniques used in teaching the elementary French and Spanish courses at the University of Florida during the past few years have been essentially applications of structural linguistics, implemented by the audio-lingual

* The research reported herein was performed pursuant to a contract with the United States Office of Education, Department of Health, Education and Welfare, Dr. A. E. Brandt, University of Florida, served as Statistical Consultant.

[1] Janet Wirth Pickler and Ralph R. Leutenegger, "The Prediction of Phonetic Transcription Ability," *Speech Monographs*, Vol. XXIX (November, 1962) pp. 288–297.

approach. Since the major emphasis on the method of instructing beginning French and Spanish at the University of Florida was audio-lingual, it was assumed that auditory skills would play a far more important role in achievement than in a "grammar translation" instructional method. The study herewith described sought to answer some of the questions raised by such audio-lingual foreign language teaching approaches.

A pilot study involving the French language only was reported in a previous issue of this journal.[2] The summary of relevant work contained therein will not be repeated in this article.

One of the important suggestions of this pilot study is that of possible sex differences on the Seashore Measures. There was a significant difference between the sexes on the initial Time and Timbre Seashore subtests. A possible sex difference was also apparent in the multiple correlation coefficients—the one for the female subjects suggesting very high predictive value of the regression equations, while that for the male subjects was less powerful.

Since the group of subjects on whom these computations were made included only 17 females and 31 males, the sex differences found were treated with caution. The 1960 revision of the Seashore Manual notes that since the differences found by prior investigators have been very small and inconsistent from one grade level to another, only combined sex norms were formulated. In view of the small sample used in this pilot study, it seemed advisable to await further results with an enlarged population before becoming concerned about the apparent sex differences reflected herein. In addition, there could have been a sex bias operating in the type of sampling used.

Other of the findings also raise certain questions which suggested the advisability of continuing this type of research. For example, the Pitch subtest for the two sexes combined showed a significant improvement when comparing test results at the beginning and end of the semester. All of the other subtests also showed considerable—though not statistically significant—improvement. Again, it is to be noted that the number of subjects on which these computations were made was quite limited.

The possibility of the importance in learning foreign languages of the aptitudes measured by the Seashore test, coupled with the possibility of improvement in these factors—suggested in the findings of the pilot study—made imperative the continuation of this research.

II. Specific Aims

The purposes of this study were (a) to measure various auditory factors of University of Florida students enrolled in the beginning courses in French and Spanish, (b) to ascertain whether a sex difference exists in any of the auditory aspects measured by the Seashore Measures of Musical Talents (i.e., pitch, loudness, rhythm, time, timbre, and tonal memory), or in any of the University of Florida orientation tests, (c) to seek to ascertain whether any of the Seashore scores, plus various intelligence and aptitude factors as measured by the Univeristy of Florida's Orientation Test Battery, can enable the prediction of ease or difficulty of mastering French or Spanish, (d) to ascertain whether scores on the Seashore auditory measures improve significantly after completing a semester's study of French or Spanish, (e) to investigate Seashore and other possible factors in French and Spanish course drop-outs, and (f) to ascertain whether significant differences exist between French and Spanish students on any of the specific factors included in the above five purposes.

III. Summary of Relevant Work

See "Auditory Factors and the Acquisition of French Language Mastery" by Leutenegger and Mueller cited previously.

IV. Procedures

For a one-year period, all students registered in French 133 (the beginning course in French at the University of Florida) were administered the Seashore Measures of Musical Talents. The test was administered via tape through the University of Florida language-laboratory earphones. The instructions for each subtest, as outlined in the 1960 revision of the Seashore Manual, were given on tape through the ear-

[2] Ralph R. Leutenegger and Theodore H. Mueller, "Auditory Factors and the Acquisition of French Language Mastery," *The Modern Language Journal*, Vol. XLVIII, No. 3 (March, 1964), pp. 141–146.

phones. Time was allowed for questions prior to each subtest. The students recorded responses on special IBM answer sheets with electrographic pencils. The same procedures were followed during the final laboratory period at the end of each semester.

The Seashore Measures consist of six subtests: Pitch, Loudness, Rhythm, Time, Timbre, and Tonal Memory. Auditory stimuli are presented in pairs which require the subject to respond by making an either-or decision. The test of Pitch requires the subject to determine, in each pair, whether the second tone is higher or lower in pitch than the first. The Loudness test requires the subject to determine whether the second tone is stronger or weaker than the first. For Rhythm the subject indicates whether the two patterns in each pair are the same or different. The Time test requires the subject to determine whether the second tone is longer or shorter than the first. The subject is required to judge whether the tones are the same or different in tone quality for the test of Timbre. For Tonal Memory there are 30 pairs of tonal sequences consisting of four-, five-, and six-tone groups. Within each pair one tone in the second sequence differs in pitch from its corresponding tone in the first sequence. The subject must identify which note it is by the number of its position in the sequence.

The scores on the various tests comprising the University of Florida's Orientation Test Battery were obtained from the Board of University Examiners. These tests include (a) the School and College Ability Test (SCAT) (or their converted ACE equivalents), (b) the Committee on Diagnostic Reading—Survey Test, and (c) the ETS English Expression Test.

The Seashore scores of students who dropped French 133 prior to the completion of a semester's work were compared with the Seashore scores of the students who did complete the semester's work.

The French language achievement scores consisted of an average of the number of errors on the daily laboratory tests. These tests followed taped drill periods on given aspects of structure. The student heard several sentences to each of which he had to respond, on machine-scoring blanks, whether or not the structure previously drilled was used in that sentence. For example, the student had to react to such questions as: (a) "Was the final consonant present which indicates the plural of the verb?," (b) "Was the pronoun used or omitted?," and (c) "Was the noun in the masculine or feminine gender?—base your judgment on the prefix used."

This technique forced the students to detect given speech sounds imbedded within a multiplicity of items demanding attention. It is assumed that such aural detection indicates an essential grasp of the sounds and the structure of the French language.

The data for all those students on whom complete records were obtained were processed by IBM techniques utilizing the IBM 709 Data Processing Machine. The various group comparisons were evaluated by various tests of significance. The multiple regression technique utilized ("Step-wise regression") weighs the various possible prediction equations and produces the most potent one.

Most of these procedures were duplicated on a one-semester basis for beginning Spanish students. Although the criterion measures of achievement in Spanish are averages of the errors on the daily tests, they differed somewhat from those used in French in that the True-False questions on which they were based tested ear comprehension of Spanish statements related to complete Spanish texts which had been read orally (tape-reproduced) during the immediately preceding drill period. In both languages, the first few sessions (and daily tests) were devoted to simpler tests of sound and accent discrimination ability.

The following are the number of subjects on whom complete data were obtained:

French Male Completors	112
French Male Drop-Outs	42
French Female Completors	105
French Female Drop-Outs	24
Spanish Male Completors	91
Spanish Male Drop-Outs	24
Spanish Female Completors	52
Spanish Female Drop-Outs	10
Total	460

V. Findings and Discussion

A. *Group Differences*

Analysis of Variance techniques were used to evaluate obtained differences on each of the 15 independent variables for each of the three

classifications—Language (L), Sex (S), and Course Completion (C). The first six independent variables were Seashore Measures: (1) Pitch, (2) Loudness, (3) Rhythm, (4) Time, (5) Timbre, and (6) Tonal Memory. Variables 7 to 11 were sub-items from the University of Florida Diagnostic Reading Test: (7) Rate, (8) Story Comprehension, (9) Vocabulary, (10) Total Comprehension, and (11) Total Reading Score. Variable 12 was the ETS English Expression Test. Variables 13 to 15 were the three SCAT measures: (13) Verbal SCAT, (14) Quantitative SCAT, and (15) Total SCAT.

Bartlett's Test for homogeneity of variance yielded significant Chi-squares for the variables Pitch, Rhythm, Time, and Reading Rate. The Chi-square values, significant at the one-percent level, with seven degrees of freedom, were Pitch—28.70, Rhythm—20.04, and Reading Rate—21.58. Time—14.17—was significant at the five-percent level. Preliminary analysis of variance tests of these four variables yielded one significant difference. The Pitch F-ratio of 3.424 was significant at the one-percent level. In view of the signficant Bartlett test for this variable which indicates that we were not dealing with one homogeneous population, we cannot say that the significance of the F-ratio is the result of differences in the means.

The preliminary Analysis of Variance tests yielded additional significant F-ratios. Significant at the one-percent level, with 7 and 452 degrees of freedom, were English ($F=15.47$), Verbal SCAT ($F=6.54$), and Total SCAT ($F=5.81$). Significant at the five-percent level, with the same degrees of freedom, were Story Comprehension ($F=2.10$) and Quantitative SCAT ($F=2.40$). In view of non-significant Bartlett Chi-squares on these five variables, the significance of the values of these F-ratios is the result of differences in the means.

The preliminary analysis of variance yielded non-significant F-ratios on Loudness, Rhythm, Time, Timbre, Tonal Memory, Rate, Vocabulary, Total Comprehension, and Total Reading Score.

A final Analysis of Variance was then completed which (a) presents the data in detail for each independent variable, and (b) takes into consideration disproportionate frequencies between cells.

The significant F-ratios for the 15 independent variables are herewith presented and discussed individually under the three classifications, Language, Sex, and Completion. Twelve of the 15 variables had non-significant interaction terms which permit interpreting the significant Main Effect F-ratios as indicating true differences in Means. Section 4 is devoted to a short discussion of the three variables—Pitch, English, and Verbal SCAT—for which significant interaction terms were obtained.

1. *Language*

The F-ratios shown in Table I on the final Analysis of Variance were significant at the levels indicated.

TABLE I

SIGNIFICANT F-RATIOS AND MEANS FOR LANGUAGE DATA

Variable	F ratio	Significance Level (in percent)	Means	
			French	Spanish
Loudness	7.00	1	44.1	43.1
Quantitative SCAT	10.42	1	36.8	34.8
Total SCAT	20.23	1	80.1	74.8
English**	7.69	1	57.5	54.2
Verbal SCAT*	16.75	1	43.3	39.8
Pitch*	4.50	5	40.8	39.2
Timbre	5.55	5	40.3	41.5
Reading Vocabulary	4.19	5	48.2	46.7
Total Reading Score	4.71	5	80.2	78.0

** This variable had significant LS and LC effects (see Section A-4).

* These variables had significant LS effects (see Section A-4).

It is to be noted that the French students achieved the higher mean scores on each of these variables with the exception of Timbre. This trend for higher scores on the part of the French students holds true throughout all variables, regardless of significance levels of F-tests or of significant interactions. The only reversal is on the Timbre variable—where the Spanish students scored significantly higher than the French students. No explanation is readily apparent for this reversal.

These data would appear to lend support to the frequently reiterated observation by foreign language teachers that French attracts a "higher calibre" student than does Spanish.

Also, the beginning French class at the University of Florida has acquired a reputation for being very demanding. It is highly likely that this reputation tends to minimize the enrollment of undermotivated or poorly motivated students.

The data further require that separate prediction equations must be obtained for the two languages.

2. *Sex*

The F-ratios on the final Analysis of Variance, Table II, were significant at the levels indicated:

TABLE II

SIGNIFICANT F-RATIOS AND MEANS FOR SEX DATA

Variable	F ratio	Significance Level (in percent)	Means	
			Male	Female
Pitch*	10.53	1	39.3	41.4
Verbal SCAT*	16.53	1	40.4	44.1
English**	85.22	1	52.8	61.1
Total SCAT	11.58	1	76.2	80.7
Time	4.38	5	41.2	40.4
Story Comprehension	5.36	5	14.8	15.5
Vocabulary	4.23	5	47.0	48.5
Total Reading Score	4.23	5	78.4	80.6

* These variables had significant LS effects (see Section A-4).

** This variable had significant LS and SC effects (see Section A-4).

Variable 4—Time—presents the only reversal of a trend for Male students to achieve lower mean scores than Female students. This trend of lower Male means also carries through all of the other variables for which F-ratios were non-significant and for which significant interactions were obtained, with the exception of Timbre (on which the F-ratio for Sex was non-significant).

When the above sex differences are viewed jointly with those discussed in Section 4 below, it is apparent that any attempt to predict foreign language acquisition must consider the sexes separately. This generalization, as all other conclusions of this study, is posited on the assumption that the students participating in this study are typical of other college-age beginning foreign language students in these aptitudes, skills, or traits.

3. *Course Completion*

The F-ratios on the final Analysis of Variance, Table III, were significant at the levels indicated.

TABLE III

SIGNIFICANT F-RATIOS AND MEANS FOR COURSE COMPLETION DATA

Variable	F Ratio	Significance Level (in percent)	Means	
			Drop-Outs	Completors
Rhythm	7.96	1	25.8	26.7
Verbal SCAT	6.07	5	40.1	42.5
Total SCAT	4.89	5	75.7	78.7
English*	6.14	5	53.7	56.9

* This variable had significant LC and SC effects (see Section A-4).

To the extent that the Verbal and Total SCAT scores are used as indices of general intelligence, it can be seen that the intelligence level of the Drop-Outs is significantly lower than that of the course completors. No record was maintained on the number of Drop-Outs who simply dropped the course in contrast to those who dropped out of school. Certainly a large percent of school drop-outs would be related to inability to deal with academic studies, and would tend to confirm the SCAT results. However, even simple course Drop-Outs could also confirm the SCAT results. Conferences with course instructors lend credence to the idea that these students, too, frequently have dropped because of poor academic standing which could be due to low intelligence, poor motivation, or inefficient study habits, or to any combination thereof.

The evidence of depressed Seashore scores is not as overwhelming as the pilot study had suggested—i.e., only the Rhythm subtest showed significantly lower scores for the Drop-Outs. The English scores are discussed further in Section 4 following.

4. *Significant Interaction Effects*

a. *Pitch.* On the final Analysis of Variance, the Language-by-Sex interaction term for the

Pitch variable was significant at the one-percent level (F=7.06); the main effect of Language was significant at the five-percent level (F=4.50); the main Sex effect was significant at the one-percent level (F=10.53).

The significant LS interaction for Pitch indicates that the two sexes did not score similarly on this variable in the two language groups.

Inspection of the Pitch means reveals that in both languages the males scored lower on this variable than did the females. However, the Spanish male-female difference was considerably greater than the French male-female difference. Means were as follows:

TABLE IV

PITCH MEANS

French Females	41.3	Spanish Females	41.8
French Males	40.3	Spanish Males	37.9

This would suggest that any proposed teaching method designed to bring the four groups of students to a common level of pitch perception would probably require the greatest time and effort on the part of the Spanish Males, followed, in order of decreasing need of such training, by French Males, and French Females.

b. *Verbal SCAT.* As in Pitch, there was a significant interaction of Language and Sex on the Verbal SCAT scores. This difference was significant at the five-percent level (F=4.14). Both Language (F=16.75) and Sex (F=16.53) were significant at the one-percent level. Inspection of the Means may help in interpreting these findings:

TABLE V

VERBAL SCAT MEANS

French Females	45.1	Spanish Females	41.9
French Males	41.7	Spanish Males	38.7

This would suggest that not only is the gap greater between the Means of the Male and Female French students, but that the levels are considerably different, with the highest-scoring Spanish students—the Females—scoring approximately the same as the lowest-scoring French students—the Males.

c. *English.* All F-test results for English were highly significant. The three interaction terms for this variable (LS, LC, and SC) were all significant—the first at the one-percent level (F=7.11), the others at the five-percent level (F=5.29 and 6.30, respectively). In addition, the main effects of Language (F=7.69) and Sex (F=85.22) were significant at the one-percent level; the Completion main effect (F=6.14) was significant at the five-percent level.

As in the preceding sections, the means for this variable reflect the trend for (a) higher French mean scores, (b) higher Female mean scores, and (c) higher means scores for Course Completors. However, while these general relationships seem to hold, inspection of means in Table VI will reveal that the levels differ from Language to Sex to Completion.

TABLE VI

ENGLISH MEANS

French Male Drop-Outs	52.2
French Male Completors	54.4
French Female Drop-Outs	59.4
French Female Completors	62.5
Spanish Male Drop-Outs	48.4
Spanish Male Completors	52.1
Spanish Female Drop-Outs	58.6
Spanish Female Completors	59.8

The Language, Sex, and Completion relationships are complex. The Sex Differences are not the same for the two languages, nor do they have the same relationships among the Completors and Drop-Outs. Similarly the differences of the language groups do not bear the same relationships to the other two effects, etc.

5. *Recapitulation*

Table VII is a recapitulation, in tabular form, of the significant F-ratios discussed in this section. The numbers represent the level of significance. (*See table on following page.*)

6. *Pre-Post Changes*

The differences between pre- and post-Seashore scores (scores achieved at the beginning and end of the semester) were evaluated by

TABLE VII

FINAL ANALYSIS OF VARIANCE: SIGNIFICANT F-RATIOS

Variable	Interaction			Language	Sex	Completion
	LS	LC	SC			
1. Pitch	1	—	—	5	1	—
2. Loudness	—	—	—	1	—	—
3. Rhythm	—	—	—	—	—	1
4. Time	—	—	—	—	5	—
5. Timbre	—	—	—	5	—	—
6. Tonal Memory	—	—	—	—	—	—
7. Rate	—	—	—	—	—	—
8. Story Comprehension	—	—	—	—	5	—
9. Vocabulary	—	—	—	5	5	—
10. Total Comprehension	—	—	—	—	—	—
11. Total Reading Score	—	—	—	5	5	—
12. English	1	5	5	1	1	5
13. Verbal SCAT	5	—	—	1	1	5
14. Quantitative SCAT	—	—	—	1	—	—
15. Total SCAT	—	—	—	1	1	5

means of the Sign Test on each of the four groups: French Male, French Female, Spanish Male, and Spanish Female. No significant changes (five-percent level) were obtained for any of these groups on any of the Seashore subtests.

B. *Multiple Regression*

In view of having obtained significant sex differences on eight of the 15 independent variables, and significant language differences on nine of the 15 variables, it was deemed necessary to obtain multiple regression equations for each language, separately by sex. The IBM 709 was used to compute the coefficients by means of the step-wise multiple regression technique. In these computations, the Total SCAT score (variable number 15) was omitted.

1. *French Females*

For the prediction of female French students, the only independent variable to emerge as significant was number 6—Tonal Memory. Accordingly, the prediction equation for French Females reads as follows:

$$Y = 3.67114 - 0.06156(\text{Tonal Memory})$$

with a standard error of Y in the amount of 1.5576. "Y" is the estimate of the dependent variable being predicted.

2. *French Males*

Of the independent variables studied, none emerged as significant in a step-wise multiple regression. Hence, it is not possible to predict French language acquisition by Males with any of the variables studied, or with any combination thereof. It is interesting to note that the one variable most closely approaching significance was "Reading Vocabulary."

3. *Spanish Females*

Of the independent variables studied, none emerged as significant in a step-wise multiple regression. Hence, it is not possible to predict any significant amount of any of the variability of the dependent variable in the case of female students of Spanish. The one variable most closely approaching significance was "Reading Rate."

4. *Spanish Males*

The one independent variable which emerged as significant on the Spanish Male multiple regression coefficient was the Total Reading Score. The prediction equation for Spanish males reads as follows: $Y = 5.28832 - 0.03687$ (Total Reading Score) with a standard error of Y in the amount of 1.8073.

5. *Sexes Combined*

Further prediction equations were run—one for each of the two languages with the sexes combined. This was done chiefly to ascertain whether any other variables would emerge as significant, thereby providing further clues to possible variables for successive attempts at refining language acquisition predictions. These equations are herewith reported for these reasons:

a. *French*

$$Y = 5.86186 - 0.03756(\text{Tonal Memory}) - 0.03668(\text{English})$$

with a standard error of Y in the amount of 1.1555.

A second, but less powerful, equation is:

$$Y = 6.94773 - 0.04176(\text{Tonal (Memory)}) - 0.02592(\text{Total Reading Score}) - 0.04286(\text{English}) + 0.03319(\text{Verbal SCAT})$$

with a standard error of Y in the amount of 1.1368. It is interesting to note that the Verbal SCAT variable bears a negative relationship to the acquisition of French language ability.

b. *Spanish*

The Spanish multiple regression coefficient for the sexes combined is as follows: $Y = 4.78726 - 0.04566(\text{Verbal SCAT})$ with a standard error of Y in the amount of 1.3059. This equation presents an inversion of the relationship that existed for French in the case of the Verbal SCAT scores.

6. *Simple Correlations*

For each of the four groups of subjects who completed their language course (French Male, French Female, Spanish Male, and Spanish Female) simple correlation coefficients were obtained on all possible pairings of the 15 independent variables, plus the foreign language achievement scores. Inspection of these scores reveals the highest correlations for all four groups to be among the various reading scores —specifically Story Comprehension and Total Comprehension, Vocabulary and Total Reading Score, and Total Comprehension and Total Reading Scores. Additional strong relationships (as reflected by correlations greater than .50) involve Verbal SCAT with the four reading scores (other than rate), and with the English score.

The variables most highly correlated with the language scores (which are expressed in terms of average number of errors), are presented by groups of subjects as follows:

French Females—Tonal Memory (−.18), English (−.13)
French Males—Timbre (−.11), Vocabulary (−.15), Total Reading Score (−.13)
Spanish Females—Time (−.17), Timbre (+.17), Rate (−.24), English (−.18)
Spanish Males—Rate (−.20), Story Comprehension (−.17), Vocabulary (−.17), Total Comprehension (−.21), Total Reading Score (−.21), Verbal SCAT (−.18)

No other variables correlate above .15, either negatively or positively. These figures certainly do not reveal any powerful relationships between the Seashore subtests and the foreign language achievement scores.

C. *Discussion*

Of considerable interest to the experimenters is finding that the French students achieved scores higher than those of the Spanish students on nine of the 15 variables studied. This might reflect a student attitude that Spanish is the "easiest" language to learn, thereby attracting less intelligent, or at least less motivated, students. Another possibility is that the findings are indicative of the local situation only where the beginning French course has achieved a reputation for being very demanding. Such a reputation can easily influence the enrollments in terms of student calibre or motivation. Florida high school enrollment figures for the school year 1962–63 show approximately 250,000 students enrolled in Spanish and 10,000 enrolled in French. Since the University enrollments in these two languages do not reflect this grossly disproportionate ratio, it is possible to infer added motivational factors in University of Florida enrollments such as the more widespread acceptance of French as a language requirement for graduate study. Hence, students entertaining the possibility of graduate work would be more likely to elect French than Spanish.

A further factor possibly related to the dis-

parity of the two language groups is the matter of TV teaching. French was offered on television; Spanish was not. While no specific data are available on this matter, academic student advisors report that many students demanded a non-TV language offering. Their seeming concern over the "impersonal" aspect of television teaching could suggest a lower-calibre student who can be swayed by factors other than the desire to study a given language. Regardless of the possible explanations, it appears obvious that no one prediction equation could adequately serve both languages—at least not as these courses were taught on the Florida campus at the time of the study.

Similarly the large number of sex differences contraindicates the use of any prediction equation based on a combined-sex normative group. On first consideration, speculation on the possible reasons for such sex differences seems intriguing, yet hardly germane to the goals of this study. However, at least one possibility may have relevance, without fanning the flames of the eternal male-female controversy. At the University of Florida, the College of Arts and Sciences requires foreign language study. This is not true of the Colleges of Engineering, Law, Medicine, and Pharmacy which have a disproportionately large number of male enrollments. These colleges in particular attract men of superior intellectual capacity. Hence, the sex ratio in the College of Arts and Sciences—which supplies the majority of the foreign language students—may not be representative of the All-University sex ratio with respect to attainment on the variables featured in this study. In these terms it might be hypothesized that the sample studied is biased in respect to male-female aptitudes. While it might be possible to hypothesize such explanations for the sex differences in the English, reading, and intelligence variables, this reasoning does not seem particularly relevant to the scores on the Seashore Measures. The significant sex differences on the Seashore subtests of Pitch and Time raise a question about the possible need for two sets of norms on this test—one for each sex.

Of the 15 possibly-predictive variables studied, only two—Tonal Memory and Total Reading Score—emerged as significant in predicting foreign language acquisition. One may have expected the SCAT scores to emerge as significant in accord with the view of Pimsleur, Mosberg, and Morrison that "the studies correlating intelligence with achievement in foreign language learning lead to the not unexpected conclusion that intelligence is a significant factor."[3] Several possibilities might be advanced in explanation of this failure to find intelligence a significant predictor. For example, the students participating in this study may have been more homogeneous in intelligence than those on whom the conclusion has been based. An additional factor which may have relevance is that the measures of achievement and the basic teaching techniques used in this study were audio-lingual rather than traditional-grammar oriented. Still another factor—and perhaps the most potent one—is the separate analysis by sex. When the sexes were analyzed separately, no intelligence score emerged as significant; however, when the obtained sex differences were ignored and multiple regression equations were run for the sexes combined, intelligence variables emerged as significant in both languages. This would seem to underscore the need to study the sexes separately on successive inquiries into language learning.

Another finding difficult to explain is the failure to obtain a predictor common to both sexes or common to both languages.

In addition, those predictors which did emerge are not overly powerful. The French Female multiple correlation coefficient was 0.17759, while the Spanish Male multiple correlation coefficient was 0.21141.

The emergence of Tonal Memory as a predictive criteria tends to lend support to John Carroll's advocacy of "Phonetic coding" as a required ability in learning a foreign language, for it would seem that Tonal Memory is basic to recognition, identification, and remembrance "over something longer than a few seconds."[4]

[3] Paul Pimsleur, Ludwig Mosberg and Andrew L. Morrison, "Student Factors in Foreign Language Learning," *The Modern Language Journal*, Vol. XLVI, No. 4 (April, 1962), pp. 160–170.

[4] John Carroll, "The Prediction of Success in Intensive Foreign Language Training," in Robert Glaser (editor), *Training Research and Education*, University of Pittsburgh Press, 1962. Chapter IV, pp. 87–136.

The emergence of a significant "reading" score as a predictor in Spanish, but not in French, might be an indirect comment on the teaching techniques utilized, for it appears that the first semester Spanish students do considerably more reading in Spanish than do the French students in French.

One possible explanation for the paucity of positive predictive findings might lie in the fact that at the time the data for this study were collected the University of Florida had no rigidly-followed formalized technique for grade placement of students in foreign language courses. Students with varying degrees of previous high school knowledge of the language could enroll in the first-term courses. Accordingly, the higher grades were over-inflated with the records of this prior-experience group. The achievement of this group in relationship to their measured attributes on Seashore, SCAT, etc., contaminates the sought-after relationships. This possible bias could be eliminated by instituting more formal grade-placement tests (and adhering to the results), or by eliminating such students from predictive studies. In the latter event, one might have to collect data for a long time in order to obtain a group sufficiently large for experimental purposes—and then stand the risk of being accused of using a biased sample.

Another possible factor in the dearth of positive prediction results could be the language achievement criteria employed. By using the average number of errors per test, and dropping the fractions, the possible range of achievement scores was severely restricted.

The various findings of this study, along with laboratory observations and "hunches," suggest to the experimenters conclusions similar to those of Pimsleur, Stockwell, and Comrey who state that "non-intellectual characteristics, notably motivation, must be included" . . . (in foreign language prediction), as well as "the personality of the student and the characteristics of the teacher."[5]

VI. Summary

Scores were obtained for 283 French and 177 Spanish students on the following: six subtests of the Seashore Measures of Musical Talents, five scores on the Committee on Diagnostic Reading Survey Test, one score on the ETS English Expression Test, and three scores on the School and College Ability Test (SCAT). Comparisons were made for each of these variables between the two language groups, the two sexes and between course completors and drop-outs.

Multiple Regression techniques were applied to the data for each language separately by sex. Language acquisition prediction equations were evolved for French Females and for Spanish Males only. The findings were discussed and interpreted.

[5] Paul Pimsleur, R. P. Stockwell and A. L. Comrey, "Foreign Language Learning Ability," *Journal of Educational Psychology*, Vol. LIII, No. 1 (February, 1962), p. 26.